5-2022

Implementation of 3-minute Diabetic Foot Exam for at Risk Diabetic Patients in Urban Primary Care Setting

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A DNP project submitted in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice

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May 2022

Approval Page with Signatures

This is to certify that the DNP Project Final Report by

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has been approved by the DNP Project Team on

April 28th 2022

for the Doctor of Nursing Practice degree

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Acknowledgements

I would like to express my thanks to Dr. Linette Rosario and the Bridgeport Primary Care Staff for giving me a great opportunity to excel in my learning through this Quality Improvement project.

I have achieved a good amount of knowledge throughout the implementation of this Quality Improvement Project and the help that I received from my DNP Project Faculty Advisor, Dr. Susan DeNisco and all my Sacred Heart University professors.

Apart from this, I would like to express special thanks to my family and friends who have supported and helped me over the past four years as I embarked on this journey through graduate school and my project despite their busy schedules.

Abstract

Background: Healthcare providers manage chronic health concerns by reducing the risk of diabetic complications among their patient population. In 2017, diabetes was the seventh leading cause of death in the United States and Connecticut. In Connecticut, there are 19,500 newly diagnosed diabetics and four Connecticut cities have higher occurrence of diabetes: Waterbury, New Britain, Hartford, and Bridgeport. Bridgeport Primary Care (BPC) had no policy or procedure in place to require the providers to complete a routine diabetic foot exam. The aim of this project was to promote and implement a tool to assist the BPC providers in evaluating adult diabetics feet to reduce the risk of diabetic foot complications.

Methods: Over 12-weeks, BPC patients with T2DM between the ages 45-64 with hemoglobin A1cs above 8%, who presented for an office visit with BPC provider, would have a diabetic foot exam. Patients were triaged with a series of yes/no questions and asked to remove their shoes and socks prior to the provider entering the room allowing for the diabetic foot exam to be completed. Referrals and follow ups were made according to the American Diabetes Association guidelines after the office visit.

Results: The goal was for the provider to perform 75% of the diabetic foot exams on T2DM between the ages 45-64 with hemoglobin A1cs above 8%, during the implementation of the workflow over 12-weeks. Of the 107 T2DM aged 45-64, 25 patients were high risk diabetic with elevated hemoglobin A1cs. Fifteen (60%) diabetic foot exams were completed over 12-weeks. The top two ICD 10 codes for T2DM patients aged 45-64 were: T2DM with Diabetic Polyneuropathy (E11.42) and Diabetes Mellitus with Peripheral Angiopathy without Gangrene (E11.51).

Conclusion: By performing diabetic foot exams at primary care visits, providers can identify early foot infections, nerve damage, and or circulation problems. This would lead to higher quality of care by referring to specialist who can assist in management of chronic foot concerns which can reduce recurrent hospitalizations, disabling complications and life-threating events.

Keywords: diabetic foot exam, diabetic foot*, primary care*, adults, adult and middle aged

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Phase 1: Problem Identification, Development of Clinical Question, and Evidence Review

Background and Significance of Problem

Management of chronic health concerns are essential to reduce the risk of other complications. Uncontrolled or undiagnosed diabetes increases the risk of multiple conditions such as diabetic ketoacidosis and ketones, neuropathy, skin conditions, eye and foot complications, nephropathy, cardiovascular disease, hypertension, and stroke (American Diabetes Association, 2021). Poulin (2020) mentioned that "in 2017, diabetes was the seventh leading cause of death in both the United States and Connecticut." According to the Center for Disease Control and Prevention (CDC, 2020), there were 34.2 million people with diabetes in the United States equaling10.5% of the population. There were approximately 26.9 million people with confirmed diabetes, 7.3 million (21.4%) undiagnosed and 88 million (34.5%) with prediabetes. Poulin (2020) gathered diabetes statistics specific to Connecticut. The statistics showed there were approximately 275,500 (9.7%) adults with diabetes, and an estimated 91,500 adults with undiagnosed diabetes. There are approximately 19,500 new cases each year. Nationally there were 34.5% of Americans who have prediabetes but only 9.1% of adults in Connecticut have been diagnosed with prediabetes. Poulin (2020) identified four Connecticut cities which have higher occurrences of diabetes. The four cities were Waterbury, New Britain, Hartford, and Bridgeport.

Data collection was focused on patients with Type 2 Diabetes Mellitus (T2DM) at Bridgeport Primary Care (BPC). The objective was to provide BPC with a screening tool which allowed for a 3-minute diabetic foot exam to be performed as point of care on patients between the ages 45-64 with hemoglobin A1cs (HbA1c) above 8%. By assessing a T2DM patient's feet at a routine office visit, Primary Care Providers (PCPs) can identify foot concerns early, which

can lead to reduced foot infections, nerve damage, and or circulation problems. Early intervention by the PCP can decrease disabling complications, non-traumatic lower-extremity amputation and life-threatening events in poorly controlled diabetics by making the appropriate referrals to a specialist.

Description of Local Problem

BPC did have a list of patient care gaps that needed to be completed within specific time frames. BPC has a policy to assess HbA1c quarterly for patients with T2DM at their appointment (American Diabetes Associates, 2016, 2020; Qaseem et al., 2018). However, there was no policy or procedure in place at BPC to require their providers to complete a diabetic foot exam. The aim of this project was to promote and implement a screening tool to assist the BPC provider in evaluating adult diabetics feet to reduce the risk of diabetic foot complications (e.g. foot ulcers, infections). The goal was for the clinical staff (e.g. medical assistants, licensed practical nurses, registered nurse) to ask the selected T2DM between the ages 45-64 with HbA1cs above 8%, if they were having any issues with their lower extremities (e.g. burning, cramping, tingling, numbness, pain, skin changes)? Once the patient entered the exam room, they were asked to remove their shoes and socks for the provider, allowing for easier access. It was also a reminder for the foot assessment to be completed by the provider during the visit.

Focused Search Question

In urban primary care patients with diabetes (P), does the implementation of a 3-minute diabetic foot exam (I) compared to current practice (C) lead to the identification of diabetic foot problems?

Evidence Search

External Evidence

To answer the selected PICOT question, a literature search was conducted within specific databases using certain keywords and filters. The databases searched were CINAHL Complete, CINAHL Full text, Cochrane Database of Systemic Review, Medline with Full Text and Nursing & Allied Health Premium. The searches were limited to articles published between 2016-2021 and written in the English language. Keywords included diabetic foot exam, diabetic foot*, primary care*, adult, adults, and middle aged.

All articles were reviewed and selected to be specific to adult or middle-aged diabetic patient who is cared for by a primary care provider. Six articles met criteria at the time of initial search. To determine the levels of evidence, the Melnyk Levels of Evidence Hierarchy was used (Melnyk & Fineout-Overholt, 2019).

Internal Evidence

The author did conduct an organizational review of policy and procedures for performing routine diabetic foot exams prior to the implementation of the screening tool. The review resulted in no policy or procedure in place at BPC.

The author did attempt to allocate organizational resources to assist in gathering the baseline data. Data analysis included pre- and post-implementation of the intervention on BPC diabetic patients. Specifically, the BPC electronic health record (EHR) was reviewed for patients with T2DM between the ages of 45-64 with HbA1cs above 8%. The data collected was: type of appointment, HbA1cs, if they have seen a specialist (such as podiatrist or vascular) within the last 6-12 months, number of diabetic patients examined, and number of patients with foot issues. The author would have requested assistance from the quality improvement team if it was difficult to acquire the results of BPC HbA1cs (Agency for Healthcare Research and Quality, 2013). The information gathered from the EHR audits has been disclosed in small

increments to the BPC staff throughout the implementation of the project. The poster will be presented at BPC morning huddle and displayed on their Huddle Board for easy review by all BPC staff which consists of registrars, Medical Assistants (MAs), Licensed Practical Nurses (LPNs), Registered Nurse (RN), Nurse Practitioner (NP), Physician Assistant (PA), Medical Doctors (MDs), practice manager, and primary care director (if available).

Notifications of the meeting will be sent via email to all BPC staff and added automatically to each person's outlook calendar. BPC management can further discuss the results at the monthly staff meeting. Once the meeting concludes, the practice manager can email the BPC staff and primary care director the meeting minutes.

Evidence Appraisal, Summary, and Recommendations

The articles that met the criteria were recorded on multiple tables. Appendix A displays the Evidence Table for Systematic Review which contains pertinent information from each article selected. Appendix B Table 7 shows the level of evidence for the seven studies selected and it was a mix of level I, III, IV, V according to the Melnyk Level of Evidence Hierarchy. There was one level I: Systemic reviews or meta-analysis, three level III: Controlled trial without randomization, two level IV: Case-control or cohort study and one level V: Systematic review of qualitative or descriptive studies. Appendix B Table 8 is an outcome synthesis of the seven selected articles on primary care and the use of diabetic foot exams. The removal of shoes and use of tools (e.g. monofilament, tuning fork) not only increased documented foot exams but also increased assessment of risk factors for foot complications. Based on the evidence, the recommendation was to promote diabetic patients to remove their shoes in office to increase diabetic foot exam to reduce the risk of diabetic foot complications.

Phase 2: Project Planning

Project Goals

1. Evaluate pre- and post-implementation of diabetic foot exam data such as HbA1cs and documented referrals to specialists (e.g. podiatrist, vascular) within last 6-12 months.
2. Evaluate number of patients examined.
3. Identify number of patients with foot problems via foot related ICD-10.
4. Total of new referrals made.

Framework

The framework premeditated for this project was the Plan-Do-Study-Act (PDSA) cycle (Appendix C). The Institute for Healthcare Improvement (IHI, 2021) uses the PDSA cycle to assist in improvement work. The PDSA cycle starts the process with three questions: (1) What are we trying to accomplish? (2) How will we know that a change is an improvement? (3) What change can we make that will result in improvement?

The plan was to gather pre-implementation information on T2DM patients between the ages of 45-64 with HbA1cs above 8%. It included HbA1c results and if the patients have seen a specialist (such as podiatrist or vascular) within the last 6 months and 12 months. The post-implementation data included total number of diabetic patients who participated, total number of foot associated ICD-10 codes and total number of patients referred to a specialist (e.g. podiatrist, vascular).

With the implementation of the screening tool, the goal was to collaborate with the multidisciplinary team to promote the 3-minute diabetic foot exam. The plan was to work directly with one provider and her clinical staff. The provider's schedule was reviewed for patients with T2DM between the ages of 45-64 with HbA1cs above 8%. The at risk T2DM

patients aged 45-64 with HbA1c above 8% were to be asked a series of simple yes/no questions and asked to remove their socks and shoes for the provider.

Upon reviewing the clinical data, the DNP student was able to evaluate the generalizability and sustainability of the 3-minute diabetic foot exam. While routine diabetic foot exams should be a standard of care in the primary care setting, the DNP student was unable to allocate an organizational policy or procedure which prompted the implementation of the screening tool over a 12-week period. The PDSA cycle was used to reevaluate the workflow and use of screening tool within BPC. This allowed the DNP student to assess the need to modify and promote continued use of the screening tool as part of the workflow for all the BPC providers.

Context

The BPC was a primary care office in Bridgeport, Connecticut which became part of Hartford based organization in October 2019. BPC providers specialize in family practice and internal medicine by promoting preventive care and conducting screening evaluations for a variety of conditions such as hypertension, metabolic problems including T2DM, obesity, cardiovascular disease and thyroid disorders. BPC serves a diverse patient population of privately insured, uninsured, underinsured, and low-income with the vast majority being Spanish speaking. This office has seven providers (five MDs, one NP and one PA), registrars, MAs, LPNs, RN, a practice coordinator, and a practice manager. In 2021, approximately 16,000 patients were seen at BPC and 7,000 were seen by BPC MD. According to the BPC dashboard, the practice had 204 (26%) of 788 diabetics between the ages of 18-75 with HbA1cs greater than 9% or no documented HbA1c; BPC MD had 59 (17%) of 352 diabetes between the ages of 18-75 with HbA1cs greater than 9% or no documented HbA1c.

Key Stakeholders

- Key stakeholders
    - BPC practice coordinator
    - BPC practice manager
    - BPC MD
    - Patients and all staff at BPC

Barriers to Implementation

Changing or adding a screening tool to a high-volume office had many challenges. BPC was constantly evolving and, in December 2020, started a new EHR. The author identified potential barriers among the clinical staff and the BPC patients. The identified barriers among the clinical staff were resistance and criticism about new workflow, time constraints, EHR documentation difficulties, difficulty initiating a new tool, lack of trust in the evidence and COVID (Spallek et al., 2010). Patient barriers were declining diabetic foot exam, time constraints, language barriers, pain, COVID related issues, and difficultly removing and or placing socks and shoes during the visit.

Timeline

May-June 2021

- Complete project proposal draft

June 30, 2021

- Complete official DNP project proposal and present to BPC stakeholders (06/30/2021)

September 2021

- Submit letter of intent to HHC IRB (09/03/2021)

- Present project proposal PowerPoint to HHC Nursing Research Council (09/08/2021)
- Submit DNP project proposal to HHC IRB for approval (09/09/2021)

October 2021 - January 2022

- Implement diabetic foot exam in BPC for 12 weeks (10/11/2021-01/14/2022)
- Gather data pre- and post- implementation of diabetic foot exam tool

January- February 2022

- Synthesize pre- and post- implementation data of diabetic foot exam tool
- Submit draft of DNP project paper to DNP advisor (02/27/2022)

March 27, 2022

- Finalize DNP project paper, PowerPoint, and poster

April 2022

- Final DNP project presentation (04/12/2022)
- DNP poster presentation (04/22/2022)
- Submit final DNP project (05/2022)

Resources

The author anticipated multiple resources such as people, material and capital throughout the implementation of this project. People were myself (DNP student, author), practice coordinator, BPC clinical staff (MA, LPN, RN), BPC MD, BPC manager, and BPC diabetic patients. Materials were computer, printer, and paper. The DNP student calculated the estimated post-implementation expenses for all the resources used, refer to Table 1.

Table 1

Estimated Post- Implementation Expenses

Personnel		**Estimated cost**
DNP Student	$37/hour x 31 hours Chart prep: 3 hours Chart review: 12 hours Synthesizing data: 16 hours **Total hours: 31 hours**	 $111.00 $444.00 $592.00 **$1,147.00**
Practice Coordinator	$20/hour x 3 hours	**$60.00**
Medical Assistant	$17/hour x 0.25 hour 1 minute x 15 patients	**$4.25**
Provider (MD)	0.024% of average annual salary $281,000 2 minutes x 15 patients	**$68.00**
White Paper 8.5” x 11”	168 sheets ($0.01) / 500 ream ($5) 56 days x 3 sheets	**$1.68**
Green paper 8.5” x 11”	10 sheets ($0.03) / 500 ream ($15)	**$3.00**
Ricoh toner Ink	48,000 pages / one toner cartridge ($21)	**$0.08**
Total Estimated Cost		**$1,284.01**

Ethical Merit

Table 2 contains the responses to differentiate if the DNP project was a quality improvement or research project. If yes was the response to the first l0 questions, and no to the remaining four questions (11-14), it indicated that this project met the criteria for a quality improvement project. It also indicated that the project did not qualify as human subjects’ research and did not have to go through the IRB at Sacred Heart University. The author

submitted a letter of intent to the HHC Nursing Research Council and project proposal to HHC IRB. HHC Nursing Council determined project met the criteria for QI and HHC IRB deemed project as "NOT RESEARCH."

Table 2

Differentiating Quality Improvement and Research Activities Tool

Question	**Yes**	**No**
1. Is the project designed to bring about immediate improvement in patient care?	X	
2. Is the purpose of the project to bring new knowledge to daily practice?	X	
3. Is the project designed to sustain the improvement?	X	
4. Is the purpose to measure the effect of a process change on delivery of care?	X	
5. Are findings specific to this hospital? In outpatient office	X	
6. Are all patients who participate in the project expected to benefit?	X	
7. Is the intervention at least as safe as routine care?	X	
8. Will all participants receive at least usual care?	X	
9. Do you intend to gather just enough data to learn and complete the cycle?	X	
10. Do you intend to limit the time for data collection in order to accelerate the rate of improvement?	X	
11. Is the project intended to test a novel hypothesis or replicate one?		X
12. Does the project involve withholding any usual care?		X
13. Does the project involve testing interventions/practices that are not usual or		X

standard of care?	
14. Will any of the 18 identifiers according to the HIPAA Privacy Rule be included?	X

Adapted from Foster, J. (2013). Differentiating quality improvement and research activities. Clinical Nurse Specialist, 27(1), 10–3. https://doi.org/10.1097/NUR.0b013e3182776db5

Data Collection Plan

The DNP student collected and compared data from the BPC electronic health record (EHR) to promote the implementation of a 3-minute diabetic foot exam at BPC. The results were assessed and disseminated as statistical data gathered during the 12-weeks from patients with T2DM, between the ages of 45-64, with HbA1cs above 8% and included HbA1cs, if the patient had a documented visit with a specialist (such as podiatrist or vascular) within the last 6 months, number of diabetic patients examined, and number of patients with foot issues.

Data Analysis Plan

The goal was to review 12-weeks of data and feedback from the staff to evaluate if initiation of the 3-minute diabetic foot exam was beneficial and/or if any changes needed to be made. Specifically, the BPC EHR was reviewed for patients with T2DM between ages 45-64 with HbA1c above 8% whose feet were assessed with the 3-minute diabetic foot exam and how many foot problems were identified. The data included if the patient had seen specialist within the last 6 months and/or if a new referral was entered into the EHR.

Phase 3: Implementation

Implementation of Project

The following paragraphs will provide the reader with the specific actions taken by the DNP Student using the selected framework: Plan-Do-Study-Act (PDSA) cycle, refer to Appendix C.

Plan: The DNP project will be proposed to DNP advisor (Dr. Susan DeNisco) and practice mentor. Once the project was approved, a letter of intent (LOI) will be submitted to the HHC Nursing Research Council. The DNP project will be presented via Zoom as a PowerPoint at HHC Nursing Research Council September 8th, 2021 meeting. The Nursing Research Council will make the determination if the project meets the criteria for a Quality Improvement (QI) or research. The DNP student will submit the project proposal to the HHC Institute Review Board (IRB) for review and once the IRB made their determination; the screening tool will be implemented in October 2021 for a duration of 12 weeks.

Do: DNP student completed proposal and project was accepted by BPC practice on June 30th, 2021. DNP student submitted LOI on September 3rd, 2021 and presented PowerPoint via Zoom to HHC Nursing Research Council on September 8th, 2021. The DNP project was determined to be a QI project, refer to Appendix D for Nursing Research Council Endorsement Letter. After receiving notification from the HHC Nursing Research Council, project proposal was submitted to HHC IRB on September 9th, 2021 and the project was determined "not research" on September 16th, 2021, refer to Appendix E. The DNP student and practice mentor selected the start date of October 11th, 2021. Provider's schedule will be reviewed the week prior and an annotation will be made in the EHR appointment notes of patients' who were T2DM aged 45-64 with HbA1cs above 8%. The clinical staff will review appointment notes of all patients to identify at risk patients with diabetic foot exam chart annotation, ask the patient the triage questions and request footwear removal in preparation for the diabetic foot exam to be completed by the provider. During the office visit, the provider will perform the diabetic foot exam on at risk patients who are between the age of 45-64 with HbA1cs above 8%, document any foot associated ICD 10 codes in the EHR and enter the appropriate specialty referral.

Study: Over the course of the 12 weeks, the DNP student will review the BPC charts weekly to identify patients who were T2DM aged 45-64 with HbA1cs above 8% and confirm the diabetic foot exam was completed on the identified at-risk patients. The clinical staff were given a simple patient questionnaire to be completed at the time of the visit and collected over the 12 weeks. The data was entered into a spreadsheet and the DNP student tallied the total number of patients seen, total of patients with T2DM, total of HbA1cs above 8%, total of patients who have seen a podiatrist within the year, total number of participants, total of diabetic foot exam completed, total of ICD 10 associated with foot concerns and total number of referrals made. All the data was categorized by age group, appointment type (in office visits, virtual visits), and if a podiatry or vascular referral was made. The goal was for the provider to perform 75% of the diabetic foot exams on T2DM between the ages 45-64 with hemoglobin A1cs above 8%, during the implementation of the workflow over 12-weeks at the office visit. The DNP student will review and present the data to BPC skate holders listed previously.

Act: Based on the feedback, the DNP student worked with the BPC staff to revise the process using the PDSA cycle to promote the sustainability of a routine diabetic foot exam during an office visit with all identified diabetic patients.

Phase 4: Evaluation

During the implementation phase of this quality improvement project at BPC, 820 patients were seen by the BPC MD and 366 (44.6%) were aged 45-64. There were 117 (32%) males and 249 (68%) females, but only 107 (29%) had the diagnosis of T2DM. There were 354 (43.2%) established patients aged 45-64 and 348 (42.4%) seen in office. Of the 107 patients aged 45-64 with T2DM, 32 (30%) had a documented podiatry visit in the last six months and 15 (14%) had a documented podiatry visit with in the last 12 months. After reviewing submitted

referrals, eight patients had podiatry referrals in the EHR from a previous visit; 22 were newly referred to podiatry and one to vascular during the 12 weeks in which the project was implemented.

Of the 107 T2DM aged 45-64, there were 25 (23%) patients who were considered at-risk for diabetic foot complications with a HbA1c above 8%. Clinical staff were to review the annotation in the patient's appointment details, ask the at-risk diabetic patients the triage questions and request the patient to remove socks and shoes. At the end of the 12 weeks, 15 (60%) of 25 diabetic foot exams were performed at the time of visit.

There were 40 (5%) of 820 patients who were given an ICD 10-foot associated diagnosis code. The three most common ICD 10 codes among all age groups were: six T2DM with Diabetic Polyneuropathy (E11.42), five Onychomycosis (B35.1), and four T2DM with Diabetic Neuropathy (E11.40). These three diagnoses were common among patients aged 45-64: T2DM with Diabetic Neuropathy (E11.40), Tinea Pedis of both feet or right/left foot (B35.3), Onychomycosis (B35.1). However, the top two ICD 10 codes for T2DM patients aged 45-64 were five T2DM with Diabetic Polyneuropathy (E11.42) and three Diabetes Mellitus with Peripheral Angiopathy without Gangrene (E11.51).

Table 3,4,5,6 display the data collected during the 12 weeks in which the diabetic foot exam was implemented at BPC.

Table 3

Data Collected over 12 weeks.	BPC Patient (n=820)
New Patient	33
New Patient 45-64	12
Established Patient 45-64	354
In Office	769
In-Office 45-64	348
Virtual	51

Virtual 45-64	18
Patients 44 and under	183
Patients between the ages 45-64	366
Patients 65 and older	269
Total Males	238
Males 45-64	117
Total Females	581
Females 45-64	249
Patients with T2DM	261
T2DM age 45-64	107
Pre-diabetes	76
Total patients with Hemoglobin A1c 8 and greater	72
Total patients with Hemoglobin A1c 8 and greater Age 45-64	25
Patients who Podiatry Foot Exam within 6 months	79
45-64 who had Podiatry Foot Exam within 6 months	32
Patients who had Podiatry Foot Exam within 12 months	46
45-64 who had Podiatry Foot Exam within 12 months	15
Total Foot Exam completed by PCP	15
Total Missed Foot Exam	10
Total ICD 10 codes associated with Foot diagnosis	40
Total ICD 10 codes associated with Foot diagnosis for 45-64	19
New Podiatry Referrals made	44
Previous (old) Podiatry Referrals	20
45-64 who have Podiatry Referral with no recent podiatry visit	22
New Vascular Referrals made	9
45-64 who have Vascular Referral	1

Table 4

Patient who met at risk criteria	**BPC Patient (n=366)**
Age 45-64	366
Males	117
Females	249
Established patient 45-64	354
45-64 seen In-office visit	348
45-64 with T2DM	107
45-64 with Hemoglobin A1c greater than 8%	25

Table 5 Results of Patient Questionnaire

Results of Survey Questions	**Questionnaire responses (n=15)**
Total completed questionnaires/foot exams	15
Males	9
Females	6

Total missed questionnaires/foot exams	10
Males	3
Females	7
Does The Patient Have A History Of:	
Previous Leg/Foot Ulcer or Lower Limb Amputation/Surgery?	1
Prior Angioplasty, Stent, Or Leg Bypass Surgery?	2
Foot Wound Requiring More Than 3 Weeks to Heal?	0
Smoking Or Nicotine Use?	3
Does The Patient Have:	
Burning Or Tingling in Legs or Feet?	7
Leg Or Foot Pain with Activity or At Rest?	7
Changes In Skin Color?	1
Skin Cuts/Scratches/Wounds?	0
Loss Of Lower Extremity Sensation?	1
Has The Patient Established Regular Podiatric Care?	11

Table 6

Documented ICD 10 codes associated with feet	**<44 (n=7)**	**45-64 (n=18)**	**65< (n=15)**	**TOTAL (n=40)**
T2DM With Diabetic Polyneuropathy (E11.42)		5	1	6
DM With Peripheral Angiopathy W/O Gangrene (E11.51)		3		3
Left Foot Gout (M1A.0720)		1		1
Plantar Fasciitis (M72.2)	2			2
Varicose Veins of Both Legs with Edema			1	1
T2DM With Diabetic Neuropathy (E11.40)		2	2	4
Varicose Veins Bilateral LE With Pain (I83.813)		1	2	3
Blister of Plantar Aspect of Right Foot (S90.821A)		1		1
Intermittent Claudication			1	1
Xerosis of Skin; Xerosis of Skin Right Foot (L85.3)		1	1	2
Peripheral Vascular Disease (I73.9)			1	1
Tinea Pedis of Both/right/left foot (B35.3)	2	2	1	5
Bilateral Edema (R60.0)	1		1	2
Lower Limb Ulcer, Left Ankle (L97.329)			1	1
Onychomycosis (B35.1)	1	2	2	5
Right Foot Pain (M79.671	1			1
Mallet Toe of Right Foot (M20.5X1)			1	1

DM: diabetes Mellitus; **T2DM**: type 2 diabetes Mellitus; **LE**: lower extremity

Phase 5: Dissemination

The DNP student's practice mentor and the BPC provider will be provided with the results of the data collected over the 12 weeks. Internal dissemination will begin at BPC morning huddle with the registrars, MAs, nurses, providers (MDs/PA/NP), and practice manager who are regularly staffed at BPC. The DNP project poster will be displayed at BPC H3W Huddle Board on April 26th, 2022. In addition, the Fairfield Region Primary Care director and HHC MG senior leaders will be notified of the findings via verbal communication or e-mail. The DNP student will submit a copy of the report and results to the HHC Nursing Research Council.

The DNP student created and presented the DNP project poster on April 22nd, 2022 with the data collected during the 12-weeks in which the 3-minute diabetic foot exam was implemented at BPC to Sacred Heart University professors and graduate students, refer to Appendix F. The author may submit project write up to Nursing Journal and present at a Diabetes and/or Primary Care Conference.

Key Lessons Learned

Presence is essential when implementing a quality improvement project. The DNP student's inability to be present consistently during the implementation period due to academic obligations and COVID restrictions, may have contributed to the underuse of the screening tool and completed diabetic foot exams. Even though the DNP student held services and explained the diabetic foot exam workflow with initial positive clinical staff feedback prior to implementation of DNP project, obstacles were met in patient selection either oversights or selecting diabetic patients that were not at risk for a diabetic foot exam.

Shared learning should be rewarded and not underestimated. Encouraging the BPC staff to take a team-based, multidisciplinary approach to promote a workflow for a standard of care was vital. This office had approximately 16,000 patients in 2021 and each face-to-face interaction should echo positivity and collaboration. The staff should have been provided an incentive of appreciation for their assistance during the 12-week implementation of the screening tool for buy-in.

Sustainability Plan

To achieve sustainability of the diabetic foot exam tool at BPC, information will need to be disseminated internally and externally, which is essential to the incorporation of the practice change (Cullen et al., 2018). Internal dissemination will begin with the registrars, clinical staff (MA, LPN, RN), providers (MD/PA/APRN), practice coordinator and practice manager who are regularly staffed at BPC. In addition, the Fairfield Region Primary Care Director and the HHCMG senior leaders will be notified of the findings via verbal communication or e-mail to promote buy-in and continuation of routine diabetic foot exam in primary care offices. Revisions to the project will be made based on stakeholder feedback. The staff will be provided with the project's statistical data about patients with T2DM between the ages of 45-64 with HbA1cs above 8%, number of diabetic patients examined and number of patients with foot issues at monthly staff meetings and the SHU poster will be posted on the BPC H3W huddle board. The BPC staff will be given continuous opportunity to provide feedback about the screening workflow and their insight to patient experiences at monthly meetings or sooner if needed to their practice manager. The quarterly reports will be posted on the department's H3W huddle board which is in a common area for staff to review freely. The report will include

statistical data informing staff of the number of diabetic patients examined and number of patients with foot issues.

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Appendix A

Search Question in PICO format:

In urban primary care patients with diabetes (P), does the implementation of a 3-minute diabetic foot exam (I) compared to current practice (C) lead to the identification of diabetic foot problems?

Article #	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
1	Wu (2018)	To study the association of EMR's clinical reminder use on a comprehensive set of diabetes quality metrics in U.S. office-based physicians and within solo- versus multi-physician practices	Level 4: retrospective cohort study	• Adults with DM • Aged 18-75 • Years 2012-2014 Office based solo or group PCP Full sample: n=5508 Non-solo: n=3596 solo n=1912	DEPENDENT • Diabetes lab tests (HbA1C, lipids) • Diabetic exams (foot, urinalysis, and retinal) • counseling (tobacco, weight, exercise, and diet) INDEPENDENT Physician responses to questions about EHR capabilities	Variables were reflected by binary indicators (1 = performed during visit, 0 = not performed during visit Clinical reminder was used (=1) if the response was "Yes, used routinely" and not used (=0)	• Mean age of sample 59yo • 41% had Medicare and 45% had private insurance • 86% visits were in urban area Sample: • 31% had hbA1c • 13%had urinalysis • 10%> had retinal (4%) or foot exams (8%) Conclusions: • EHR reminders increased odds of hgA1c, urinalysis, foot exams	High level of evidence Mean age of 59 86% of the visits were in urban setting • Low % of retinal/foot exam conducted
2	Mullan (2020)	to identify current preventative and early intervention diabetes-related foot care practices among Australian primary care healthcare professionals	Level 3: Cross-sectional study	• FT General practitioners (n=10) & Credentialled Diabetes Educators (n=84) from PC who care for pts w/ DM for 12+ months • Between Apr-May 2019 (4wks)	DEPENDENT • Survey instrument INDEPENDENT • Practice location (state & territory)	46 question survey Likert scale: % of pts each week receiving each item of care by the survey participant: '1 1⁄4 never (0%)', '2 1⁄4 very rarely (1 – 20%)', '3 1⁄4 rarely (21 – 40%)', '4 1⁄4 sometimes (41 – 60%), '5 1⁄4 often (61 – 80%)', '6 1⁄4 very often (81 – 99%) and '7 1⁄4 always (100%)'.	Implementation of "no shoes, no socks, more service" initiative→ nurses asked DM pts to be bare ft before physician entering→ increased ft exams 94 surveys completed Provider had 15+y of experience 16 worked outside of PC (n=78 in PC) 45% (n=42) removed socks & shoes at consult 50%+ of the time (GP=4, NP=7, CDE= 31) • FT exam "not always adopted"	Moderate level Promoting removal of socks and shoes increased ft exam • Comprehensive ft exam not conducted
3	Murphy (2019)	to increase the number of comprehensive foot	Level V: Quality improvement Retrospective data	60 randomly selected EHRs Rural health setting Pts w/ T2DM w/ increases	INDEPENDENT • PCP and clinic nurse DEPENDENT	n = number of patients with T2DM presenting during 15-week project n=number of foot exams	IN 2017: • 42% pf pts received ft exam • 100% PCP and clinic nurses participated of educational sessions • After 15 wks, 68% of pts w/ DM had	High level Authors used PSDA cycle during implementation Implementation of tool increased PCP

Article #	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		examinations for adults with type-2 diabetes mellitus in rural primary care		risk for ft issues Aged 19+years 60 patients to reviewed 2017 80 patients reviewed in 2018 Education given to PCP and clinic nurses	• Survey instrument PE of ft by providers	completed % of patients receiving a foot exam n= number of risk assessments completed % of patients receiving a risk assessment	comprehensive ft exam • 35% (n=21) female btw age 52-92 w/ mean age 72 • 65% (n=39) male btw age 38-85 w/ mean age 62 IN 2018: • 52.5% (n=42) female btw age 26-89 w/ mean age 67 47.5% (n=38) male btw age 47-84 w/ mean age 66	adherence to recommend diabetic ft exam Focused on adults • FT exams completed on 63% (50/80) patients with DM over 15-week trial
4	Azzopardi (2018)	to compare different screening modalities in the detection of diabetic peripheral neuropathy in a primary care setting.	Level 3: prospective Non-experimental comparative Cross-sectional study	Primary care n=100 participants w/ DM for at least 10years aged btw 40-89y	Patients verbalizing vibration during ft exam	vibration perception (Present versus Absent) while the other variable included the instruments used (VibraTip, 128 Hz tuning fork, neurothesiometer).	57 male & female, mean age of 72 w/ DM Pt who did not sense vibration VibraTip- 28.5% Neurothesiometer- 21% 128Hz tuning fork-12%	Low quality of evidence • Focus was on neuropathy
5	Heald (2019)	to determine how data collected during the course of diabetes reviews of patients in UK primary care can inform a risk model to predict de novo foot ulcer presentation	Level 4: retrospective cohort study	Men & women aged 16-89years 46 general practices in central/eastern Cheshire and Derbyshire, UK n=17, 053 individuals n= 1127 individuals with ft ulcers	• HbA1c • Age • Monofilament sensation absent • Creatinine Hx of stroke		Absence of monofilament sensation was more common in pt w/ ft ulcer compared to pts w/o ft ulcer and Absence of one or more ft pulses age over 55 years, serum creatinine over 150μmol/L, HbA1C over 9.5% (80mmol/mol), social disadvantage, absent monofilament sensation and absent foot pulse are relevant to evaluation of the risk of foot ulceration	Moderate quality of evidence Age group Elevated hbA1c • Social disadvantage pt population
6	Crawford (2015)	systematic review of individual patient data (IPD) to identify	Level 1: Systemic review	Reviewed 16 cohort studies 10 selected w/ individual pt data	Risk factors from individuals w/ no foot ulcers	• Age • sex • duration of diabetes • monofilaments • pulse	The use of monofilament or absences of one pedal pulses will identify moderate to immediate risk of foot ulcer Hx of foot ulcer or lower-extremity amputation is high risk identifier	• High level of evidence to promote implementation of dm foot exam in PCP to reduce risks

Article #	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		the most highly prognostic factors for foot ulceration (i.e. symptoms, signs, diagnostic tests) in people with diabetes.)		Over 16,000 ppl worldwide				
7	Williams (2018)	project was to increase foot examinations performed among healthcare providers in primary care settings by implementing a reminder system in the electronic health record (EHR) in the charts of diabetic patients to alert the provider to perform and document the foot examination	Level 3: Descriptive exploratory Cross-sectional study	3-month study Pre-post implementation of study Patients from 2 clinics n= 293 patients with T2DN	Foot exam results • Neuro • vascular Vital signs BMI	Data collected from EHR • age • gender • BMI • # of years w/ DM • Type of DM • HbA1c • Foot exam results • Dx of peripheral neuropathy, HTN, CAD, HLD	37.2%- risk of diabetic foot ulceration Predictors that increase risk of foot ulcer • 6th grade education or lower • Lower income • Pts who wore open toe shoes • Had skin discolorations • Diabetic peripheral neuropathy 43% lost protective sensation 19% dx w/ arterial disease 52% at risk for diabetic foot ulcers	High level of evidence • Specific to current project goal

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Appendix B

Table 7: **Level of Evidence Synthesis Table**

Article Number	1	2	3	4	5	6	7
Level I: Systematic review or meta-analysis						X	
Level II: Randomized controlled trial							
Level III: Controlled trial without randomization		X		X			X
Level IV: Case-control or cohort study	X				X		
Level V: Systematic review of qualitative or descriptive studies			X				
Level VI: Qualitative or descriptive study, CPG, Lit Review, QI or EBP project							
Level VII: Expert opinion							

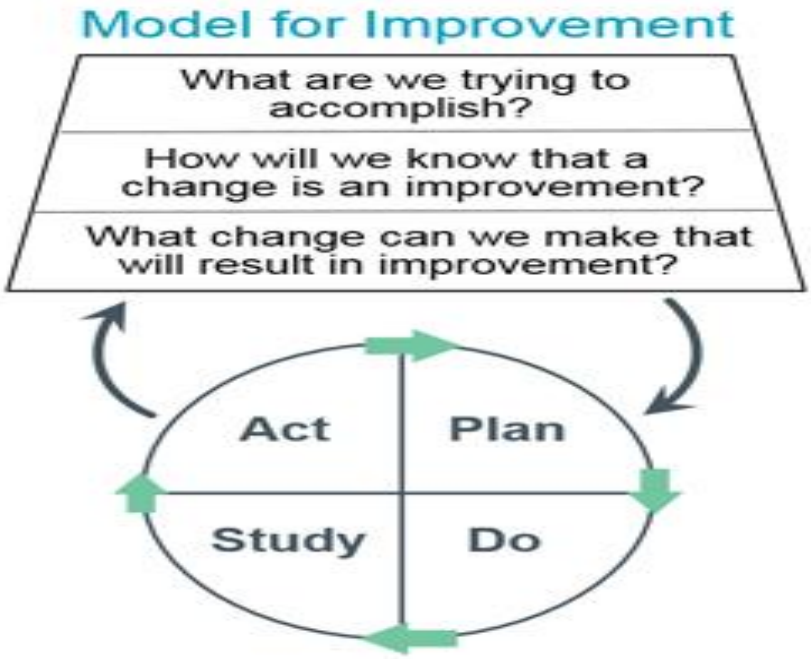
Table 8: **Outcomes Synthesis Table**

Article Number	1	2	3	4	5	6	7
Adults with T2DM	*	*	*	*	*	*	*
Primary care setting	*	*	*	*	*	*	*
Assessed for risk factors of foot complications				*	*	*	*
Diabetic foot exam	↑	↑	↑	*	*	*	↑
Hemoglobin A1c	*	NE	NE	NE	*	*	NE
Use of tools (e.g. monofilaments, tuning fork)	NE	NE	NE	*	*	NE	*

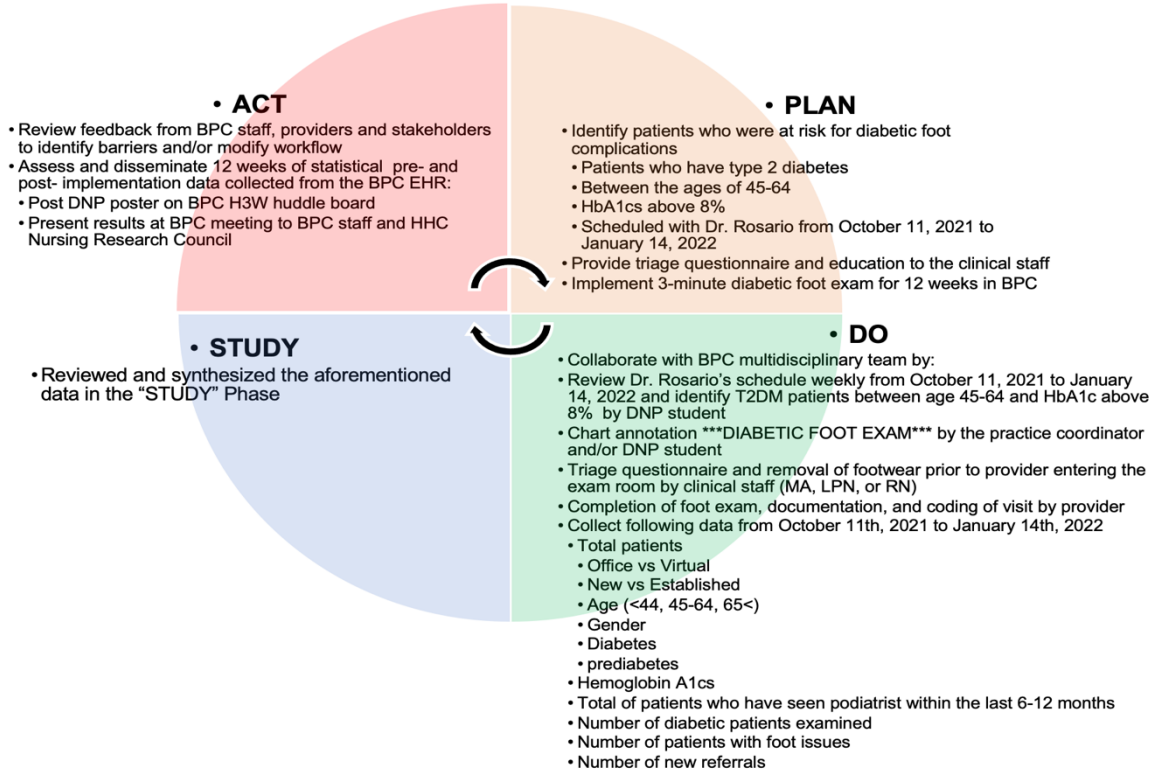
*- evaluated; NE- not evaluated; ↑-Increased

Appendix C

Plan-Do-Study-Act (PDSA) cycle (IHI, 2021);



Completed PDSA for DNP project poster



Appendix D

Nursing Research Council – Project Endorsement Status

Date: September 8, 2021

Dear Suzana:

Thank you for submitting a Letter of Intent for your proposed project "Implementation of 3-minute Diabetic Foot Exam to Promote Foot Examination of Diabetic Patients in Urban Primary Care," to the Nursing Research Council on September 8, 2021. Discussion during the meeting included the importance of the project to the HHC mission and vision for population health. There was a question about actual conduct of the foot examination; you noted that the PCP would do the exam. ADA standards and monofilament testing should be involved, according to one member. You might contact Diabetes Lifecare regarding recommendations. You noted that you are working with a podiatrist who is familiar with professional recommendations. There was a recommendation to look specifically at what factors found on your exams are associated with increased diabetes problems and to review appropriate literature to support your work. You may find that when you submit to IRB, issues of consent will emerge. You described your outcome measures include number of participants, number of emergent issues, and number of referrals. You'll want to be VERY clear about what you will collect before you submit it to the IRB.

After review of your Letter of Intent and project, the Nursing Research Council endorses the following:

XX□2. **This project appears to be quality improvement**
You should proceed to the HHC Research Administration website and make a submission to the iRIS website for official review: https://intranet.hartfordhealthcare.org/organizations-departments/hartford-hospital/researrch

See R side box: Online Applications: iRIS

Create a password and follow the directions:
"Add a New Study"
"Request Form - Determination that a Proposed Activity is Not Research or is Not Human Subjects Research"
The Human Research Protections Program makes the determination whether a potential activity is research involving human subjects. If the activity is not research, or does not involve human subjects, you will receive a letter stating this determination. That letter is your official requirement to continue your project.

On behalf of chairs of Nursing Research Council Hartford Hospital.

Appendix E

IRB Approval

HUMAN RESEARCH PROTECTION PROGRAM
80 SEYMOUR STREET
P.O. BOX 5037
HARTFORD, CT. 06102-5037
860/972-2893 FAX 860/545-5112
irb@hhchealth.org

Suzana Alvarez

September 16, 2021

Institutional Review Board (IRB) - (Assurance #FWA00021932)

Dear Ms. Alvarez,

Your proposed activity entitled, "***Implementation of 3-minute Diabetic Foot Exam to Promote Foot Examination of Diabetic Patients in Urban Primary Care***" has been reviewed by the Human Research Protection Program. It has been determined that this does not meet the federal definition of research according to 45 CFR 46.102(l), does not produce generalizable knowledge, nor is it an investigation of an FDA regulated product and, therefore; does not require further review or oversight by the Institutional Review Board.

Please be aware that any publication of this activity or your experience may not be represented as research.

Should any changes occur to the procedures or proposed purpose that may affect this status, please contact the HRPP office at (860) 972-2893 or irb@hhchealth.org to ensure compliance with federal regulations and IRB policies.

Approved Key Study Personnel: Alvarez, Suzana

The Hartford HealthCare HRPP Policies and Procedures and the Belmont Report are available for your review on our website at: https://hartfordhealthcare.org/health-professionals/research/medical-professionals/institutional-review-board-irb/policies

Appendix F

DNP project poster:

Presented at SHU on April 22nd, 2022

Displayed at BPC H3W Huddle Board on April 25th, 2022.